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Patentanmeldung Nr. Patent application No. Demande de brevet n°

02078127.4

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

Anmeldung Nr:
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Demande no:

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Anmelder/Applicant(s)/Demandeur(s):

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Floating lowering and lifting device

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Floating lowering and lifting device

It is known to lower large weight packages (templates for example) on to the seabed with cables from a floating barge. A problem with the prior art systems which uses a tensioned connection between the weight and the floating vessel like a cable to take the weight, is that due to the movements of the floating vessel snap tensions will be introduced in the cable.

As very long cables and very large weights are used, these snap tensions can break the cable (this problem is solved by the construction in US5190107, a heave compensating support system for positioning a sub sea work package). In very deep waters and with very large weights, the diameter and the weight of the cables are becoming to big to handle: for example the weight of a 6 inch cable of 1000 m is about 100 tons and the diameter of the cable will be to big to handle.

It is possible to use devices to lower packages onto the seabed with the help of pressurized closed buoyancy cans. The cans must be so constructed that it withstands the water pressure at seabed level; every 10 m water depth will add 1 bar. Such a system is shown in Shell US5190107 patent.

Very deep waters have relative high pressures are at seabed level. This latter combined with the relative large weight to be transported makes the use of closed buoyant cans very expensive due to the size of this buoyancy module and the construction needed to avoid collapsing of the buoyancy module.

The new idea is a method and device for lowering to the seabed of a heavy package (500 tons or more) in relative deep water (for example 1000m). The device is characterised in that it can be connected to and disconnected from the package and includes a large, "soft volume" structure which has an opening to the environment in the lower part and which can be filled with a gas above his opening to add buoyancy. Due to the fact that it is not a closed pressure module, the construction can be relative simple and constructed with low costs as there will be no pressure differences between the inside and the outside of the module. The gas (air) inside the open structure will compensate the weight of the structure and the weight of the package to be transported to the seabed, at any position during the lowering. Adding gas will ensure a controlled lowering /deployment of the combination of the device and the connected package, for example creating an uplift of 490-500 tons by a package weight of 500 tons. During the

way down, gas (air or Nitrogen) need to be added into the open bottom structure as the volume of gas trapped in it the will be reduced due to the increase of the external water pressure. The combination sinks due to the resultant small negative buoyancy of the combination, which can be controlled, from the floating barge by a vent system on the module. After depositing the load on the seabed, gas is removed from the chamber via a gas release mechanism to maintain neutral buoyancy on a small positive buoyancy after disconnecting of the load.

The gas can be air, which can be added with a small diameter flexible tube (see fig. 1) in this preferred embodiment the soft volume structure is connected via an air duct to a floating vessel.

Alternatively Nitrogen gas (see fig. 2) can be added which is stored as liquid Nitrogen in relative small, closed liquid gas cans connected to the structure. The release of gas be done in a controlled way via remote control or via electrical cable from the floating vessel.

Fig. 3 shows a device having a combination of enclosed space with permanent buoyancy (air, foam) and a soft volume (open bottom) area: for example the open area could be partly filled with (permanent or removable elements of hard shell foam, just enough to compensate for the weight of the transport structure.

Further, Fig. 4 shows a compensating device, which can be used for the concepts shown in figures 1, 2 and 3.

Once the package is on the seabed, the part of the trapped gas within the device that was compensating for the weight of the package must be ventilated, as the seabed will take the weight of the package. When this is done a safe disconnection of the package and the device can be made without rocketing the transport device up to the sea level. During the way up, gas needs to be ventilated to create a controlled lift of the device.

The forgoing procedure is reversed when a heavy weight package must be removed from the seabed.

The cable connecting the device and the floating barge can be a very small diameter cable as it now does not need to take the weight of the whole device/package as this latter is made more or less neutral buoyant. The main function of the cable is to guide/keep track of the device /package combination and to take up only a limited amount of weight (for example the cable is able to take 10 tons by a package weight of 500 tons).

Instead of a cable the device could be connected to the floating barge with an electrical umbilical that serves as a power supply for thrusters connected to the device so that a more accurate positioning of the weight is possible. The same umbilical can be used for controlling the venting and/or the release of Nitrogen gas into the open bottom area.

Claims

1. Floating lowering and lifting device comprising a floating structure and a lifting unit lowerable from the floating structure towards the sea bed, the lifting unit having a chamber with at least one opening in its wall, and a gas supply means connected to a gas inlet opening in the chamber, the gas supply means being connected to the floating structure via a control line, wherein the chamber comprises a releasable coupling member for releasably attaching to a load.

2. Floating lifting device according to claim 1, wherein the gas supply means are placed on the floating structure, the control line comprising a fluid supply duct connecting the gas supply means and the chamber.

3. Floating lifting device according to claim 1, wherein the gas supply means comprise a container connected to the chamber via a controllable valve, the container comprising a liquefied gas, the control line being an electrical control line connected to the valve for controlling the gas supply to the chamber.

4. Floating lifting device according to any of the preceding claims, wherein the chamber is suspended from the floating structure via a guide cable.

5. Floating lifting device according to any of the preceding claims, the chamber comprising at least one thruster powered via the control line.

6. Floating lifting device according to any of the preceding claims, wherein the chamber comprises a closed compartment.

7 Floating lifting device according to any of the preceding claims, wherein the guide cable or control line is connected to an arm on the floating structure, the arm comprising a sheave, and a counterweight attached to the sheave via an arm, the sheave being suspended from the arm.

8. Floating lowering and lifting device according to any of the preceding claims, having a gas release mechanism connected to the control line which is adapted to be opened after placing the load on the sea bed, prior to detaching the releasable coupling member.

Deepwater deployment and retrieval system

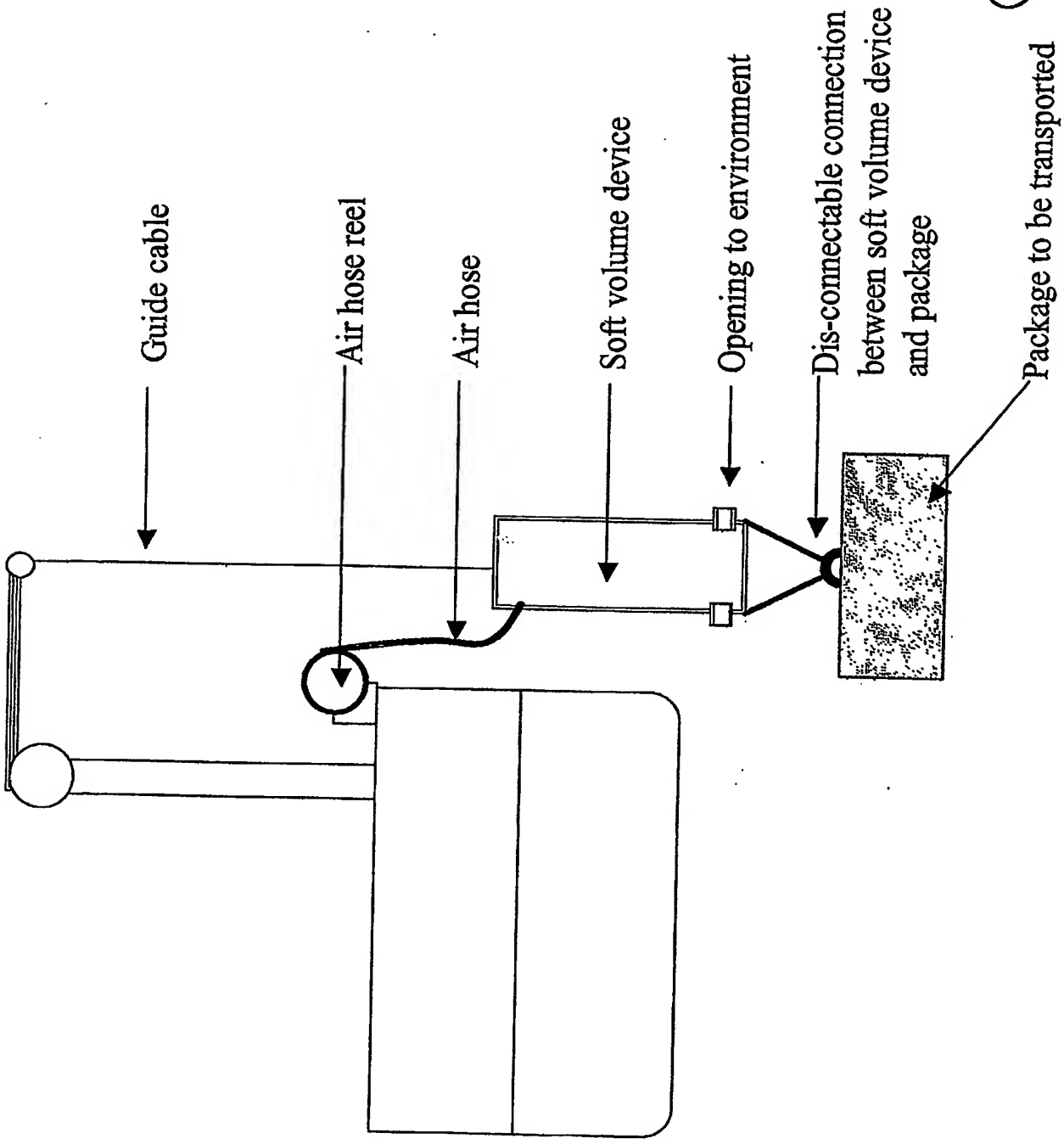

Fig. 1

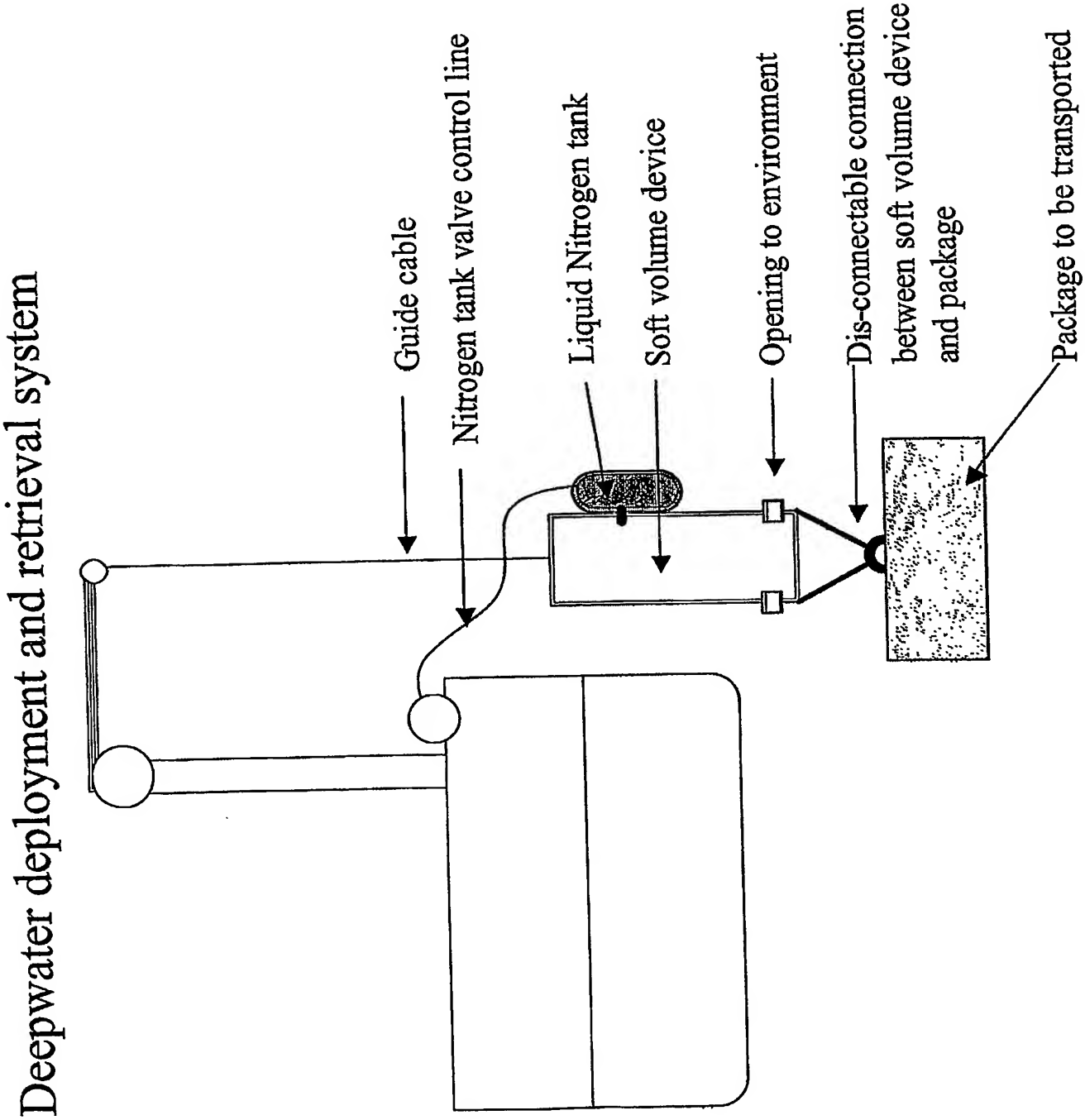

Fig. 2

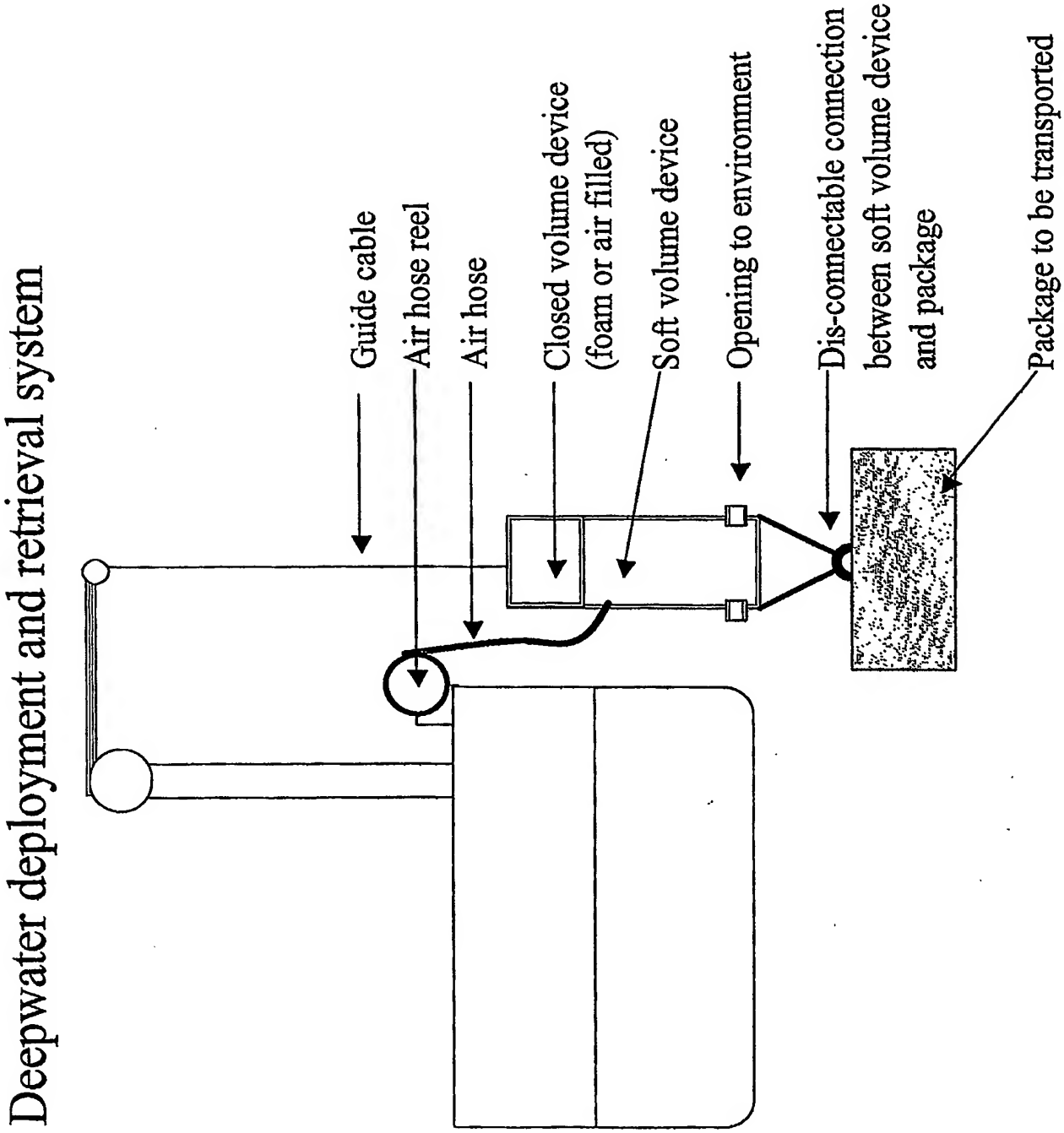

Fig. 3

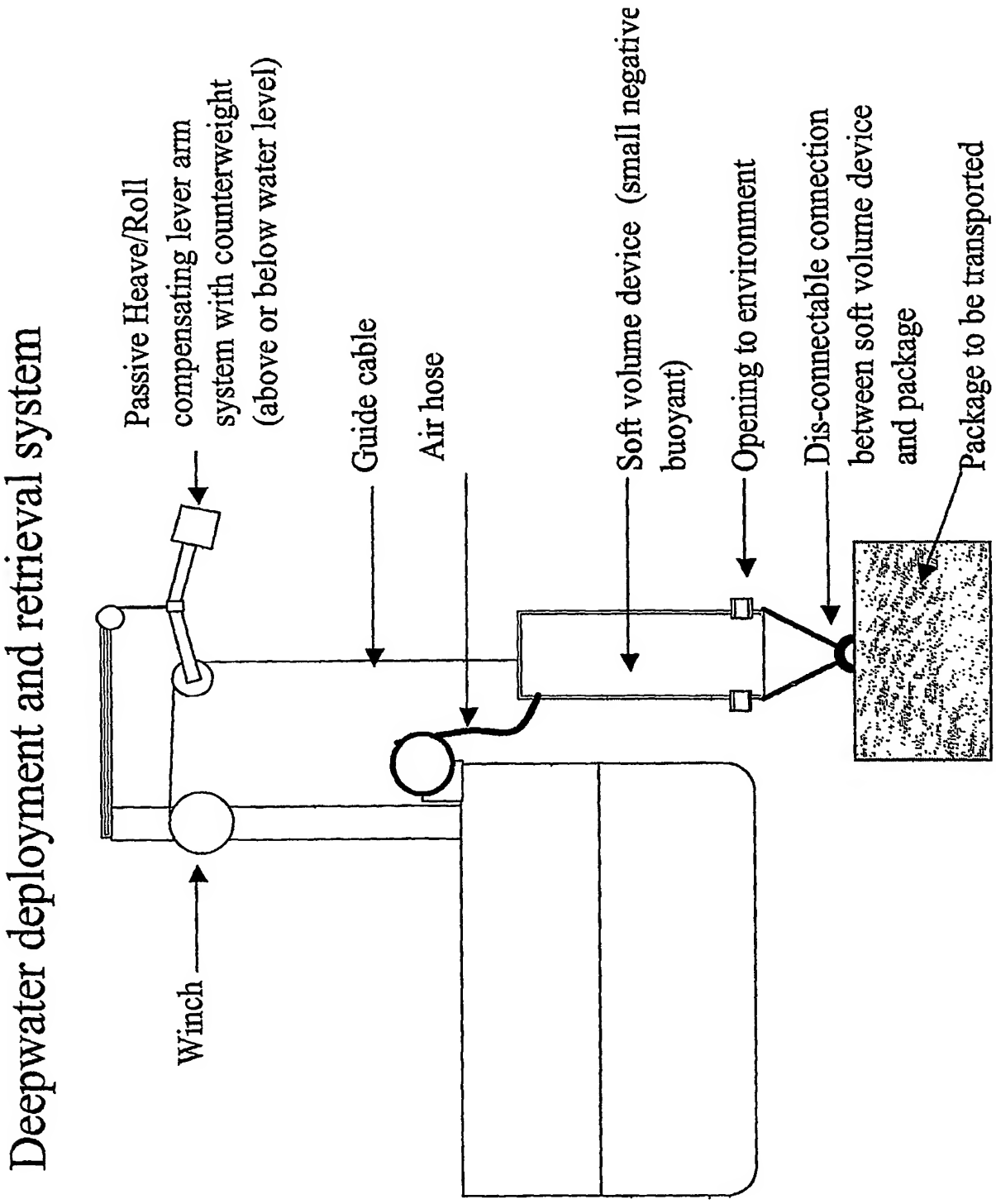

Fig. 4